

Claims

Ref C1

1. A Gram-positive bacterium which has been transformed with a heterologous gene encoding pyruvate decarboxylase or a functional equivalent thereof, but has solely native alcohol dehydrogenase function.

2. A Gram-positive bacterium according to claim 1 wherein the bacterium is a *Bacillus* sp.

Sub A1

3. A Gram-positive bacterium according to claim 1 or 2 wherein the bacterium is a thermophile.

4. A Gram-positive bacterium according to claim 2 or 3 wherein the *Bacillus* is selected from *B. stearothermophilus*; *B. calvodex*; *B. caldotenax*, *B. thermoglucosidasius*, *B. coagulans*, *B. licheniformis*, *B. thermodenitrificans*, and *B. caldolyticus*.

5. A Gram-positive bacterium according to claim 1, 2, 3 or 4 wherein the gene encoding lactate dehydrogenase expression has been inactivated.

6. A Gram-positive bacterium according to claim 5 in which the lactate dehydrogenase gene has been inactivated by homologous recombination.

7. A Gram-positive bacterium according to any preceding claim in which the heterologous gene is from *Zymomonas* sp or from *Saccharomyces cerevisiae*.

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8. A Gram-positive bacterium according to claim 7 in which the heterologous gene is from *Z. mobilis*.

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9. A Gram-positive bacteria according to claim 7 in which the heterologous gene is *pdc 5* from *S. cerevisiae*.

10. A Gram-positive bacterium according to the preceding claim wherein the heterologous gene is incorporated into the chromosome of the bacterium.

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11. A Gram-positive bacterium according to any one of claims 1 to 9 in which the bacterium has been transformed with a plasmid comprising the heterologous gene.

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12. A Gram-positive bacterium according to claim 11, wherein the plasmid is pFC1.

13. A Gram-positive bacteria according to any one of claims 1 to 9, wherein the heterologous gene is operatively linked to the lactate dehydrogenase promoter from *Bacillus* strain LN (NCIMB accession number 41038).

14. Strains LN (NCIMB accession number 41038); LN-T (E31, E32); TN (NCIMB accession number 41039); TN-P1; TN-P3; LN-S (J8) (NCIMB accession number 41040); LN-D (NCIMB accession number 41041); LN-D11 and LN-P1.

15. A recombinant, sporulation deficient, thermophilic *Bacillus* which grows at greater than 50°C.

16. A recombinant sporulation deficient, thermophilic *Bacillus* which grows at greater than 50°C and which is not *B. licheniformis*.

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17. A method of producing ethanol comprising culturing a bacterium or strain according to any one of claims 1 to 13 under suitable conditions.

18. A method according to claim 17 in which the method is operated at a temperature between 40- 75 °C.

19. A method according to claim 18 operated at a temperature of 52-65 °C

20. A method according to claim 18 operated at a temperature of 60-65 °C.

21. A method of producing L-lactic acid comprising culturing strain LN under suitable conditions.

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22. A nucleic acid molecule comprising the lactate dehydrogenase promoter region of strain LN (NCIMB accession number 41038).

23. The nucleic acid molecule of claim 22, wherein the nucleic acid molecule comprises the nucleic acid sequence shown in Figure 8.

24. Plasmid pFC1.

25. Plasmid pFC1-PDC1

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